Modular RadialHeat Oud Heating Ecosystem

Public Disclosure Document – Updated 14 May 2025 (Rev-D)
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🟧 1 Problem Statement – Why Oud Lovers Need a New Heater

High-grade agarwood (oud) is wasted daily because the two dominant traditions sit at opposite extremes:

1. **Japanese Kōdō** – requires ~10–15 min of precise ash-cone sculpting, careful charcoal positioning, and constant fanning. Beginners routinely under-heat, releasing only faint notes of resin before the coal dies.

2. **Arabic Bukhoor / Mabkhara** – drops chips directly on glowing coal. Fast, but heat spikes > 350 °C scorch the resin, creating thick smoke, tar build-up, and wildly inconsistent scent profiles.

Modern users—spas, perfumers, meditators—need a **fast, repeatable, portable** solution that hits the 180–280 °C "sweet band" where agarwood oils vaporise without charring. Current electric heaters solve consistency but kill ritual aesthetics and off-grid portability.
🟧 **Goal:** Deliver a **modular charcoal ecosystem** that combines Kōdō purity with bukhoor speed, without electronics.

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2 RadialHeat Ring-Coal Standard – The "USB-C" of Incense

🟦 USP Call-out

> **"First charcoal engineered to heat *through* the ring, not *past* it."**

Every invention docks to a single **annular charcoal spec** that produces lateral heat flow.

- **Inner Ø:** 20 ± 0.2 mm (insert seat)
- **Outer Ø options:** 30 / 40 / 50 mm (heat grades)
- **Height:** 12 / 15 / 20 mm
- **Void Depth:** ≥ 10 mm
- **Composition:** Coconut-shell charcoal (96 %), food-grade tapioca starch binder (≤ 3 %), moisture (≤ 1 %).
- **Bulk density:** 0.82 g cm^{-3}
- **Ignition time:** 35 ± 5 s with butane torch.
- **Burn time:** 38 ± 2 min (Gentle), 47 ± 3 min (Table), 54 ± 4 min (Arabic).

2.1 Definition of Terms

Term	Definition
Insert	Non-combustible part placed in ring void (mica disc, lava cartridge, etc.).
Radial conduction	Heat travelling laterally from combustion zone into insert/payload.
Payload	Aromatic material to be heated: chip, powder, or pre-filled cartridge.

2.2 Why RadialHeat Beats Hookah Rings

Hookah Rings	RadialHeat Rings

Center void = air chimney; nothing sits inside.	Void becomes *thermal pocket* containing insert + payload.
250 °C spike then drop; ash falls on shisha.	Controlled 180–280 °C plateau; ash isolated.
Discrete part; no accessories fit inside.	**Ecosystem hub** for plates, pins, cartridges & burner stand.

2.3 🟦 Comparison with Open-Fire Alternatives (Candles, Direct Flame Incense)

Metric	RadialHeat Ring Coal	Candle-Heated Oud (tea-light warmers)	Direct Flame (stick/cone)
Heat profile	180–280 °C plateau ± 8 °C	140–190 °C drift ± 25 °C	300–600 °C spike, uncontrolled
Aroma purity	No paraffin or wick volatiles; ash isolated	Wax & wick fumes can mask oud; occasional soot	Combustion smoke, tar; dominant burnt note
Prep time	30–45 s torch ignite	5–7 min for wax pool to heat plate	Instant but < 2 min per chip
Safety	Embers contained in ring; low spill risk	Open flame + hot liquid wax spill hazard	Open flame; ember drop risk
Ritual aesthetics	Glowing coal & aromatic vapor	Soft candle glow; wax aroma interference	Harsh smoke; utilitarian

Among open-fire methods, **RadialHeat offers the only portable solution that preserves ritual flame while delivering precision comparable to electric heaters.**

🟧 3 Invention 1 – Variable Ring-Coal Sizing (Fuel Module)

Three calibrated rings share the 20 mm inner Ø so **one insert fits all**. Temperature data at chip surface measured with K-type thermocouple 2 mm above payload:

Grade	OD × H (mm)	Plateau °C (μ ± σ)	Burn Time (min)	Suggested Scenario
Gentle	30 × 12	195 ± 7	38	Solo kyara sniffing, tea meditation
Table	40 × 15	222 ± 8	47	Spa room, two-person ceremony
Arabic	50 × 20	262 ± 9	54	Majlis, fragrance layering

Why It Works

- Radial conduction + calibrated charcoal mass → **±8 °C** temp band vs **±25 °C** for disc-on-coal.
- Coconut briquette cuts mangrove deforestation and lowers CO_2 footprint by **≈ 60 %** per session.

🟧 4 Invention 2 – Integrated Heat-Plate Ring (Hybrid Fuel + Insert)

Construction

- **Ring:** Table size (40 × 15 mm) briquette.
- **Disc:** Laser-cut mica sheet, Ø 19.8 mm, thickness 2 mm, $\lambda = 0.8\ W\ m^{-1}\ K^{-1}$.
- **Pin:** 304 SS, Ø 1.2 mm, height 4 mm, press-fit through mica.
- **Placement:** Disc sits ⅔ down void; creates 4 mm air gap below payload.

Operating Profiles

Mode	Assembly	Surface °C	Aroma Lead-Time
Standard	Chip on disc, ring around	220 ± 6	45 s
Boost	Disc used as *lid*, ring on top	255 ± 7	30 s

Advantages

- Stored heat in disc flattens curve (see Fig. 2).
- Pin suspends odd-shaped chips; no ash contamination.
- Manufacturing uses existing hookah-ring press + post-insert laser station (adds <$0.22 COGS).

🟧 5 Invention 3 – Self-Igniting Oud Cartridge (All-in-One Pod)

A travel-safe module that lights with a cigarette lighter.

- **Dimensions:** Ø 19.8 × H 8 mm.
- **Charge:** 0.4 g quick-light briquette impregnated with potassium nitrate (0.7 %) + vegetable glue.
- **Insert:** 1.8 mm mica disc bonded underneath.
- **Payload:** 0.15 g chipped agarwood (or ~15 mg kyara in premium SKU).
- **Ignition → Aroma:** 8 s.
- **Plateau:** 205 ± 10 °C for 18 min.
- **Shelf life:** 24 months in aluminium blister pack (0.5 % Δ mass).

🟧 6 Invention 4 – Modular Table Burner (Support Module)

Two cost-tier variants support two payload modes (raw-chip & cartridge).

6.1 Variant A – Classic Mechanical Stand (No Magnet)

- **Body:** CNC-spun 304 SS dish, Ø 70 mm, wall 0.8 mm, weight 46 g.
- **Centre Seat:** Concentric raised lip 0.6 mm high, ID 50.2 mm — auto-centres any ring OD ≤ 50 mm.
- **Vent Pattern:** 12 radial lotus slots 3 × 15 mm (design-patent target).
- **Legs:** M4 threaded SS posts, 20 mm, silicone feet; unscrew for handheld mode.
- **Finish:** Raw brushed SS (entry) or matte-bronze PVD (spa).

6.2 Variant B – Deluxe Magnetic Stand

- **Adds** N35 NdFeB ring magnet (Ø 25/21 × 2 mm) press-fit under lip — “drop-and-click” user experience.

- **Weight:** 48 g; COGS + $0.18 over Classic.

6.3 Payload Modes

Mode	Works With	Setup	Typical Use
Raw-Chip Mode	Mica plate with pin (drop-in accessory)	Seat plate on lip, place ring around	High-end kyara ceremonies
Cartridge Mode	Invention 3 or Invention 5 cartridges	Place cartridge in seat, ring on top	Quick spa treatments, travel

Performance (Classic vs Deluxe)

Metric	Classic (Lip)	Deluxe (Magnet)
Centre mis-alignment (user avg)	1.8 mm	0.5 mm
Plateau extension vs no stand	+4 min	+4 min
Added COGS	+$0.00	+$0.18

🟧 7 Invention 5 – Reversible Drop-In Cartridge (Insert Module)

- **Core:** Porous lava bead (basalt), Ø 19.5 × h 3 mm, porosity 22 %.
- **Mica Laminate:** 0.8 mm sheet bonded beneath for structural integrity.

- **Pin:** Removable titanium GR2, Ø 1.0 mm, for food-contact compliance.
- **Dual Modes:**
    - **Mode A (Drop-In):** Cartridge inside ring void → radial heating 210 °C.
    - **Mode B (Foundation):** Cartridge on tray, ring placed over → vertical + radial 245 °C.
- **Tolerance:** OD –0/ +0.05 mm ensures no rattle yet easy insertion even after heat-expansion.

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8 Draft Claim Set (Updated)

1. **Independent Claim** – Annular heat source dimensioned to receive an insert bearing oxygen-sensitive aromatics, wherein combustion gases are prevented from direct contact.
2. **Dependent** – insert comprises mica, porous lava, or basalt; includes central pin; seated 40–80 % of ring height.
3. **System Claim** – kit containing at least two ring sizes and (i) a mechanical stand or (ii) a magnetic stand enabling cartridge and raw-chip modes.
4. **Method Claim** – steps of (i) selecting ring grade by temperature chart, (ii) placing payload, (iii) igniting, (iv) allowing radial conduction to volatilise aromatics within 30–60 s.
5. **Design Claim** – lotus-vent ornamental pattern on support stand.

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9 Performance-Validation Plan (Expanded)

Test	Metric	Target	Result-Proto A

Thermal plateau	σ < ±10 °C for 25 min	Pass (Gentle & Table)
GC-MS PAH vs direct coal	−30 % or better	−32 %
User sensory panel (purity 1-5)	≥ 4	4.3 avg (n = 12)
Structural integrity post-burn	No crack / warp	No defects in 10 cycles

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10 Risk & Compliance Matrix

Risk	Mitigation	Standard
Finger burn	Silicone tongs, QR-linked demo	ASTM F2058
Salt off-note	Pure-Lite SKU	–
Child access	ISO 8317 foil	EN 862
Combustion CO	Ventilation warning on pack	ISO 13571

Future electric add-on → UL 1482 / CSA B366.

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11 Prior-Art Log

Reference	Gap vs RadialHeat
XYZ hookah ring	No insert, airflow chimney only
Tennen kōdō ash + mica	Needs ash bed, 15 min prep
Electric heater	Electronic, lacks ritual flame, requires mains

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12 Manufacturing Snapshot (10 k units)

SKU	Process	COGS	Retail	Gross %
Gentle ring	Briquette press	$0.16	$2.20	92 %
Table ring	Briquette press	$0.18	$2.50	93 %
Heat-plate ring	Press + laser seat	$0.48	$5.50	91 %
Classic stand	CNC + PVD	$3.17	$27.00	88 %
Deluxe stand	CNC + PVD + magnet	$3.35	$29.00	88 %
Cartridge 3-pk	Press + blister	$0.95	$9.00	89 %

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13 Commercialisation Roadmap

- **Q3-2025:** Crowdfund artisan line, ship Gentle starter kit + Classic stand.
- **Q4-2025:** Spa/retail onboarding; cartridge subscription launch; Deluxe stand debut.
- **H1-2026:** OEM supply to luxury perfume houses; release electric adapter (UL compliant).

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14 Legal Notice

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